Project 10-015 Electrical Shock SURFOR, SUBFOR, AIRFOR, NECC

Data

Data Range: FY00 to present (6/8/2010)
Data Source: NAVSEA is the data source for shipyard OSHE data. INJTRK and SIMS databases from the Navy Safety Center.

Bottom line Up Front

- SURFOR electrical shock rates on a decreasing trend.
- Current SURFOR FY10 rate and count are statistically significantly lower
- Current SUBFOR FY10 rate and count are statistically significantly lower
- AIRFOR electrical shock rates on a decreasing trend
- Current AIRFOR FY10 count of electrical shock incident is statistically significantly lower
- Current NECC FY10 incident rate is statistically significantly lower
- The electrical shock incident rates for Navy civilian/contractor are on an increasing trend
- SUBFOR rates for the five year period ranging from FY05 to FY09 on average were statistically significantly higher than the rates for SURFOR, AIRFOR, NECC and Navy civilian/contractors
- For SURFOR, SUBFOR and AIRFOR personnel under the age of 25 have a higher probability of being involved in an electrical shock incident.
- For SURFOR, SUBFOR and AIRFOR personnel between the ages of 35 to 55 have a lower probability of being involved in an electrical shock.
- For SURFOR, the rate with the most electrical shock incidents is ET3, for SUBFOR, MM2 and for AIRFOR – AT3.

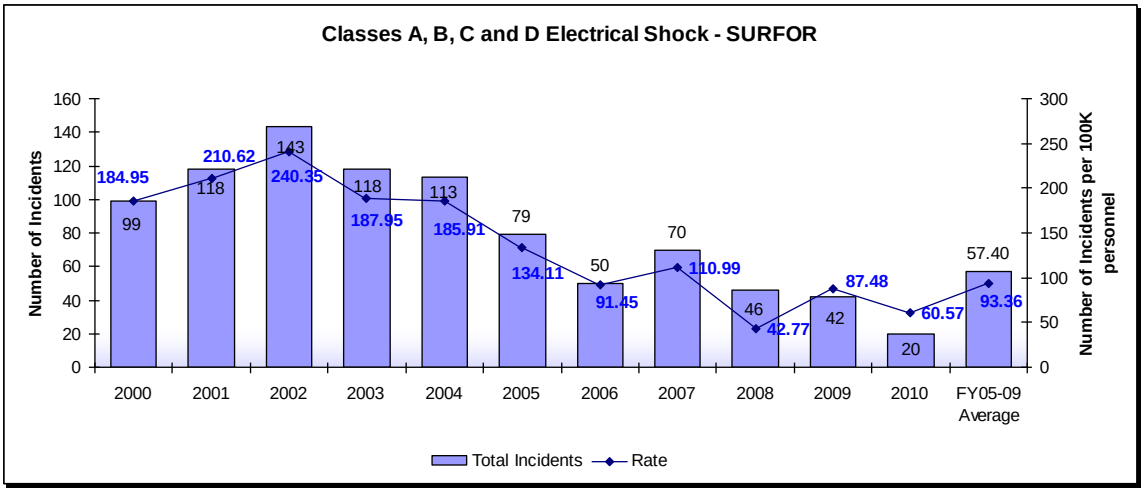

Figure 1

Figure 1 graphs the number of electrical shock incidents for Class A, B, C and D mishaps for SURFOR along with the incident rate per 100,000 personnel. The number of mishaps and rates tend to be on a downward trend. When statistically comparing the rates from FY00-04 to the rates from FY05-09, there is a statistically significant difference

between the incident rates from FY00 to FY04 and incident rates from FY05 to FY09. In further analysis, the FY05 to FY09 rates are statistically significantly lower than the rate from FY00 to FY04. It can be concluded that the rates from FY05 to FY09 have been decreasing.

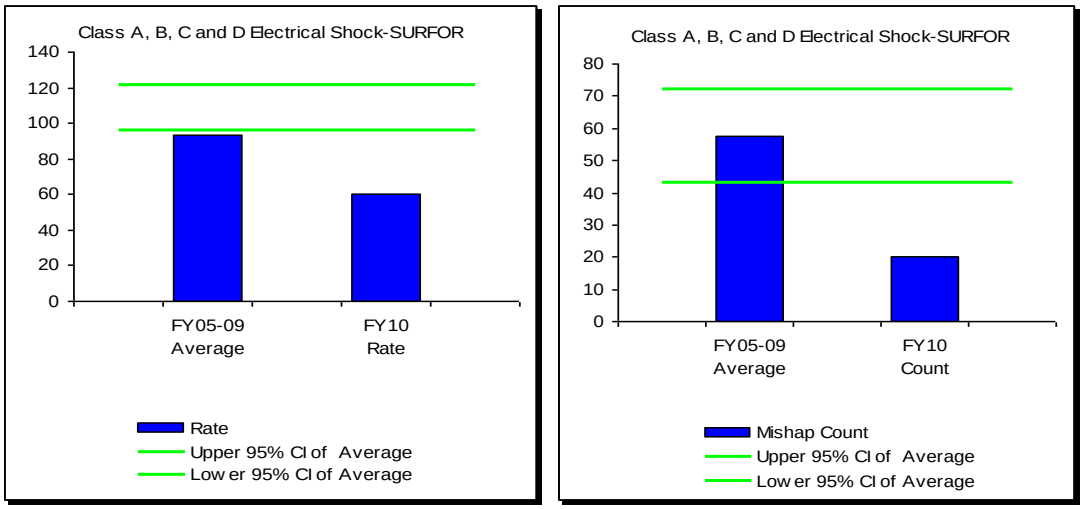

Figure 2

The first graph in Figure 2 graphs the 5 year average electrical shock incident rate and the current FY10 rate of 60.57 along with the 95% confidence interval depicted by the green lines. The current FY10 is below the confidence interval indicating the current rate is statistically significantly lower than the previous 5 year rates. The second graph graphs the 5 year average number of electrical shock incidents along with the current FY10 count along with the 95% confidence interval depicted by the green lines. The current FY10 count is also below the confidence interval indicating the current number of electrical shock incidents is statistically significantly lower than the 5 year average.

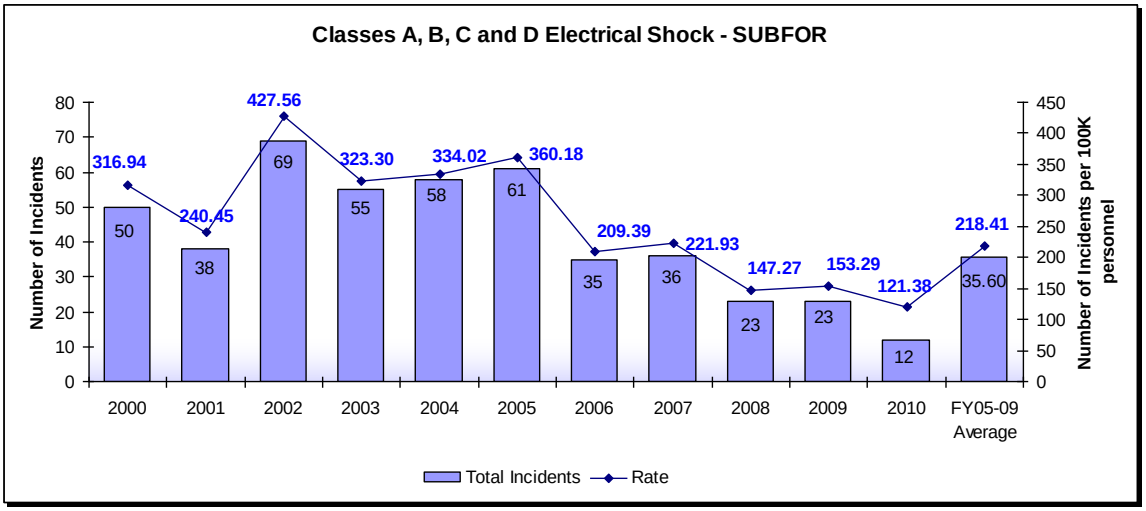

Figure 3

Similarly to Figure 2, Figure 3 graphs the number of electrical shock incidents and the incident rates per 100,000 personnel for SUBFOR. The rates from FY06 to FY10 are

lower than FY00 to FY05. However, there is no statistically significant difference between the rates from FY00 to FY04 and the rates from FY05 to FY09.

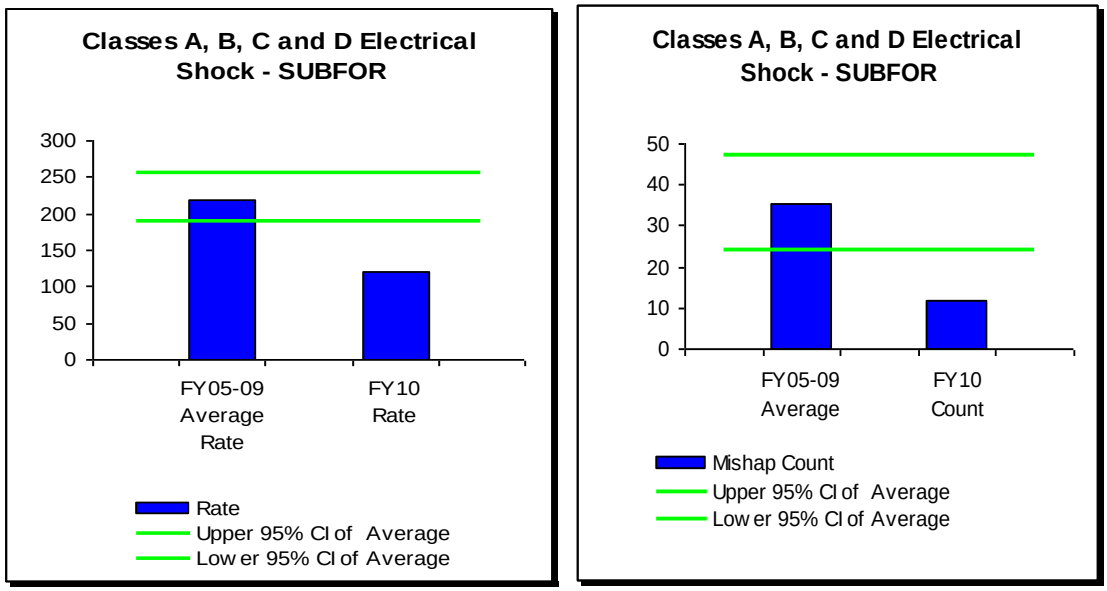

Figure 4

The first graph in Figure 4 graphs the FY05-09 average electrical shock incident rate, the current FY10 electrical shock incident rate and the 95% confidence intervals represented by the green lines. The current FY10 electrical shock incident rate is below the confidence interval indicating the current FY10 is statistically significantly lower than the rates from the previous five years. The second graph in Figure 4 graphs the 5 year average number of electrical shock incidents and the current number of electrical shock incidents for FY10 along with the 95% confidence interval represented by the green lines. The current number of FY10 electrical shock incidents fall below the lower boundary of the confidence interval indicating the current number of FY10 electrical shock incidents is statistically significantly lower than the 5 year average.

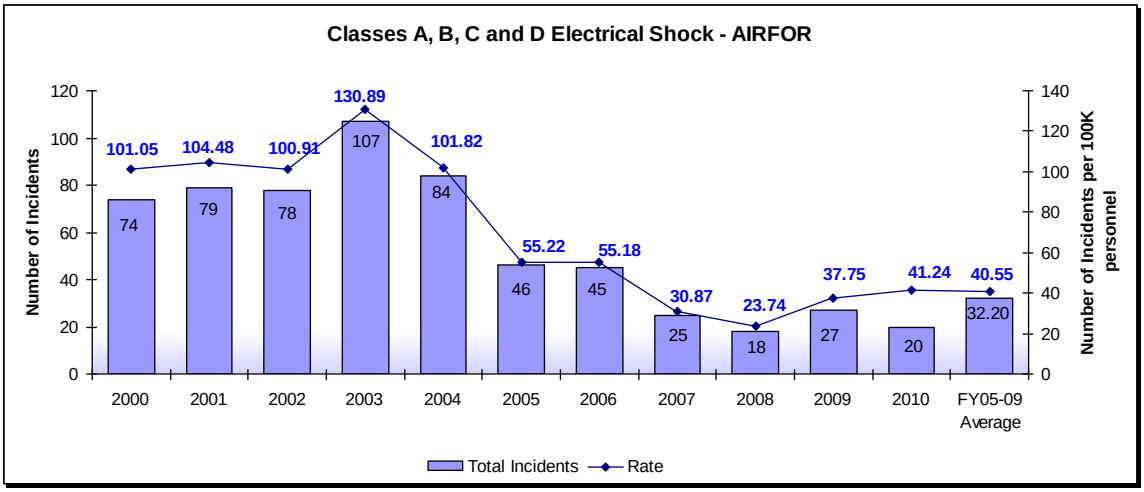

Figure 5

Figure 5 graphs, much in the same manner as Figure 2 and 3, the number of electrical shock incidents and the electrical shock incident rates for AIRFOR from FY00 to FY10. The electrical shock incident rates show a decreasing trend in rates starting in FY05. Statistically, there is a significant difference in the rates from FY00-04 and the rates from FY05-09. In fact, the rates in FY05-09 are statistically significantly lower than the rates from FY00-04. It can be concluded that the rates from FY05 to FY09 have been decreasing.

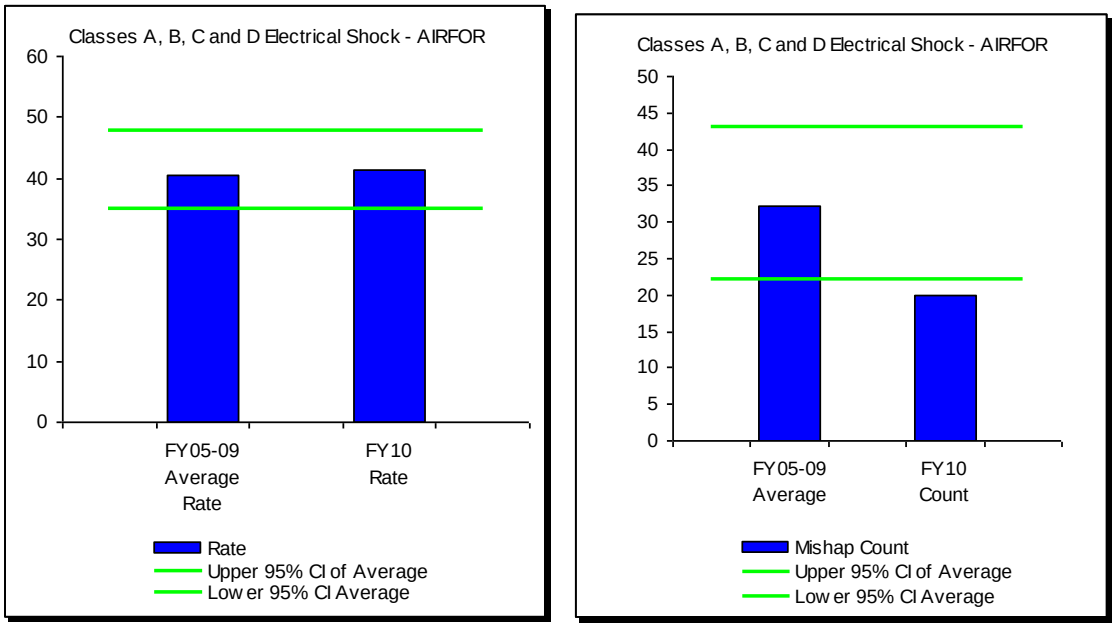

Figure 6

The first graph in Figure 6 graphs the 5 year average electrical shock incident rate, the current FY10 electrical shock incident rate and the 95% confidence interval depicted by the green lines for AIRFOR. The current FY10 rate is with the upper and lower confidence boundaries indicating no statistically significant difference between the current FY10 rate and the rates from the previous five years. The second graphs the 5 year average number of electrical shock incidents, the current number of electrical shock incidents that have occurred in FY10, and the 95% confidence interval represented by the green lines. The current number of FY10 electrical shock incident for AIRFOR is under the lower confidence boundary indicating the current number is statistically significantly lower than the 5 year average.

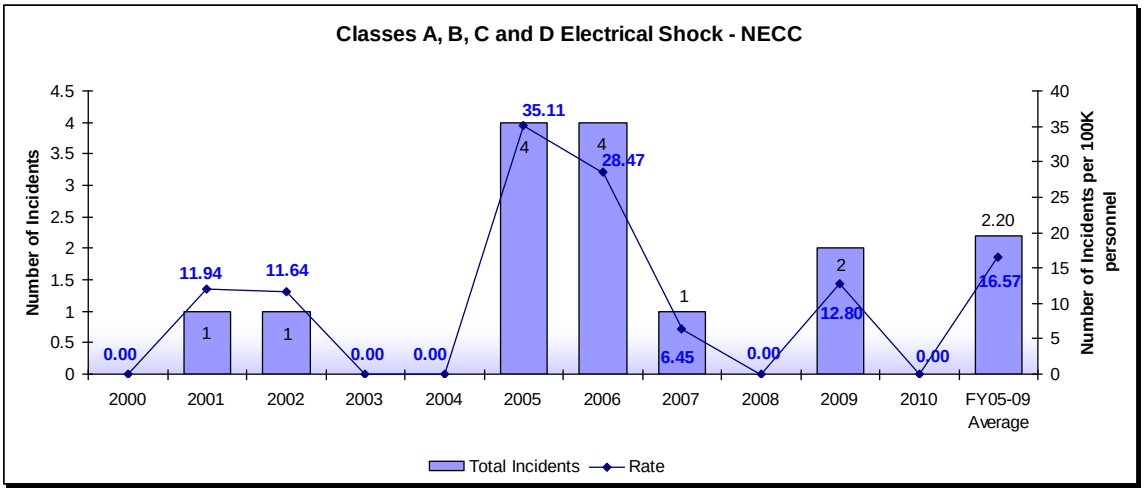

Figure 7

Figure 7 graphs the number of electrical shock incidents and electrical shock incident rates from FY00 to FY10 for NECC. There seems to be no evident trend in the data. There is no statistically significant difference in the rates from FY00 to FY04 and the rates from FY05 to FY09.

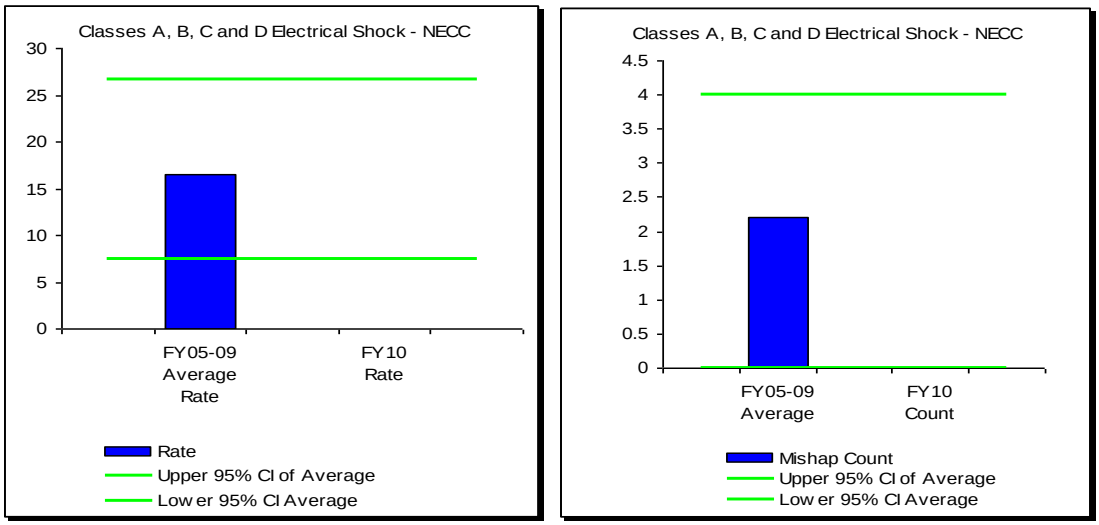

Figure 8

The first graph in Figure 8 graphs the 5 year average electrical shock incident rate, the current FY10 electrical shock incident rate and the 95% confidence interval boundaries for NECC. The current FY10 rate is 0 and is below the lower confidence interval boundary thus indicating the current rate is statistically significantly lower than the previous 5 years rates. The second graph in the Figure 8 graphs the 5 year average number of electrical shock incidents, the current FY10 number of electrical shock incidents and the 95% confidence interval. The current number of FY10 electrical shock incidents for NECC is 0 and is within the confidence interval indicating no statistically significant difference in the 5 year average number of incidents and the current FY10 number of incidents.

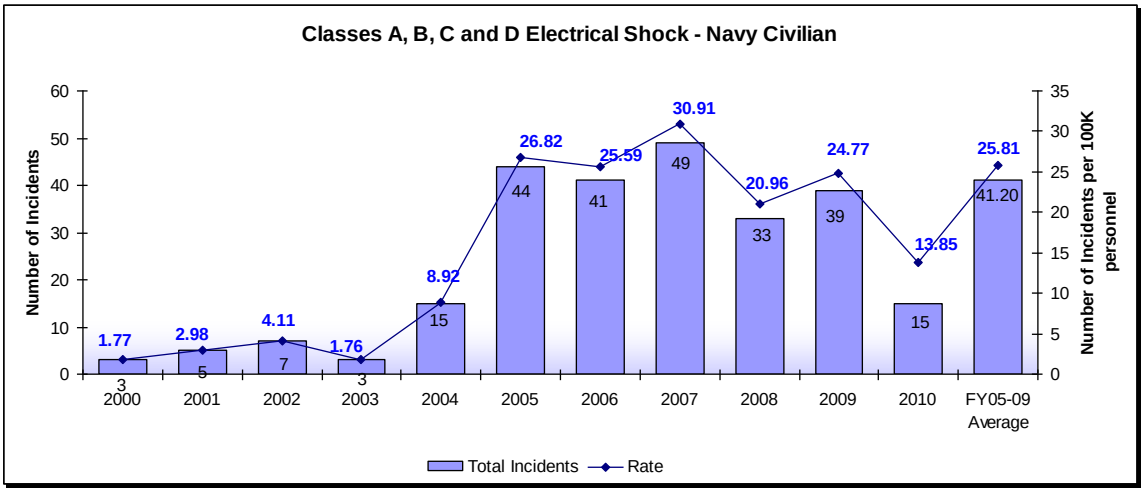

Figure 9

Figure 9 is the same type of graph as in Figure 5 except this graph plots the number of electrical shock incidents and rates for Navy civilians and contractors. There seems to be an increase beginning in FY05. This however may be due to the fact that OSHE data supplied by NAVSEA was only obtained starting in FY05. Data from FY00 to FY04 was obtained from the INJTRK database. When statistically comparing the rates from FY00 to FY04 to the rates from FY05 to FY09, the rates from FY05 to FY09 are statistically significantly higher than the rates from FY00 to FY04. It can be concluded that the rates are on an increasing trend.

When statistically comparing the 5 year average ranging from FY05 to FY09 of SURFOR, SUBFOR, AIRFOR, and Navy civilian/contractor to each other using the Poisson Distribution, SUBFOR average incident rate is statistically significantly higher than all the other rates. SURFOR average incident rate is statistically significantly higher than AIRFOR average incident rate and the Navy civilian/contractor average incident rate. There is no statistically significant difference between the average incident rate for AIRFOR and the Navy civilian/contractor average incident rate.

The analysis below is only conducted on the data obtained from SIMS. NAVSEA OSHE data did not contain the ages of the individuals involved.

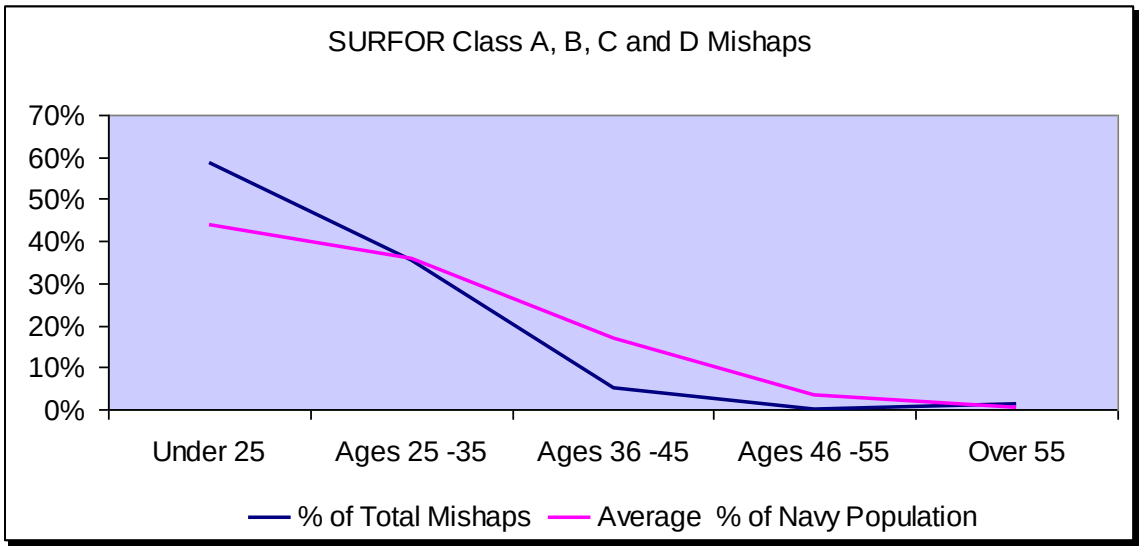

Figure 10

Figure 10 graphs the percentage of total mishaps of Class A, B, C and D Electrical shock incidents for SURFOR along with the FY00 to FY09 average percent of the Navy population by age group. The percentage of total mishap involving personnel under the age of 25 is above the 10 average percentage of Navy personnel under 25 in the Navy population. When statistically comparing the ages groups to the Navy population, personnel under the age of 25 have a higher probability of being involved in an electrical shock incident. Personnel between the ages of 35 to 55 have a lower probability of being involved in an electrical shock incident.

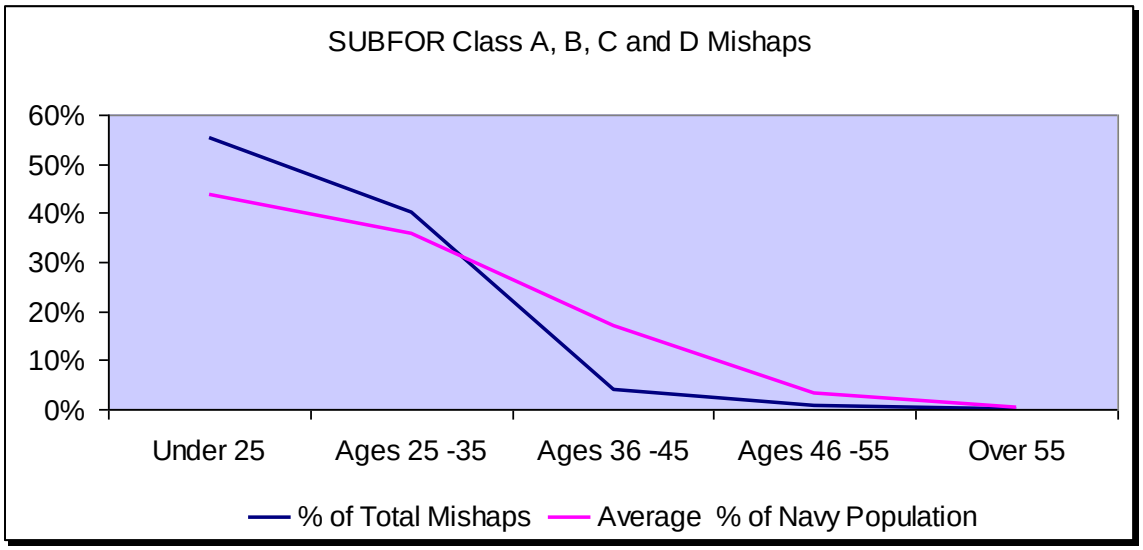

Figure 11

Figure 11 graphs the in the same manner as Figure 8 the percentage of total Class A, B, C and D electrical shock mishaps for SUBFOR and the 10 average percentage of the Navy population per age group. The total percentage of mishaps for personnel under the age of 25 and between the ages of 25 to 35 are above the ten year average percentage of the Navy population for those age groups. Just like SURFOR, personnel under the age of 25

have a higher probability of being involved in an electrical shock mishaps and those personnel between the ages of 35 to 55 have a lower probability of being involved in an electrical shock mishap. There was no statistically significant with the age group of 25 to 35.

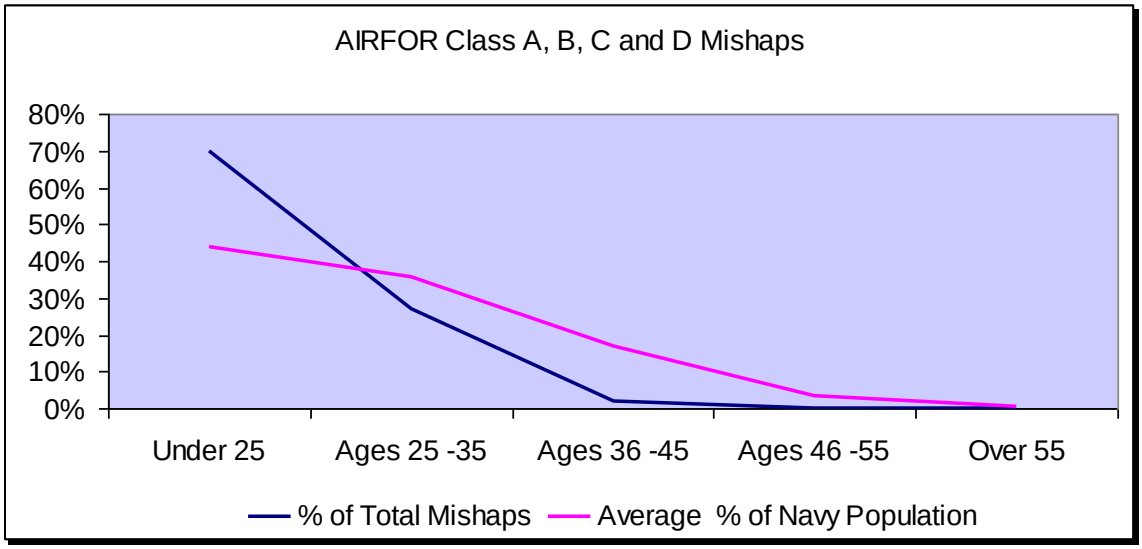

Figure 12

Figure 12 graph the percentage of total mishaps for Class A, B, C and D electrical shock mishap for AIRFOR along with the 10 year average percentage of the Navy population per age group. The percentage of total mishaps for the Under 25 age group is above the 10 year average percentage of the Navy population for personnel under the age of 25. As with SURFOR and SUBFOR, personnel under the age of 25 have a higher probability that they will be involved in an electrical shock incident. Those personnel between the ages of 26 to 54 have a lower probability of being involved in an electrical shock incident.

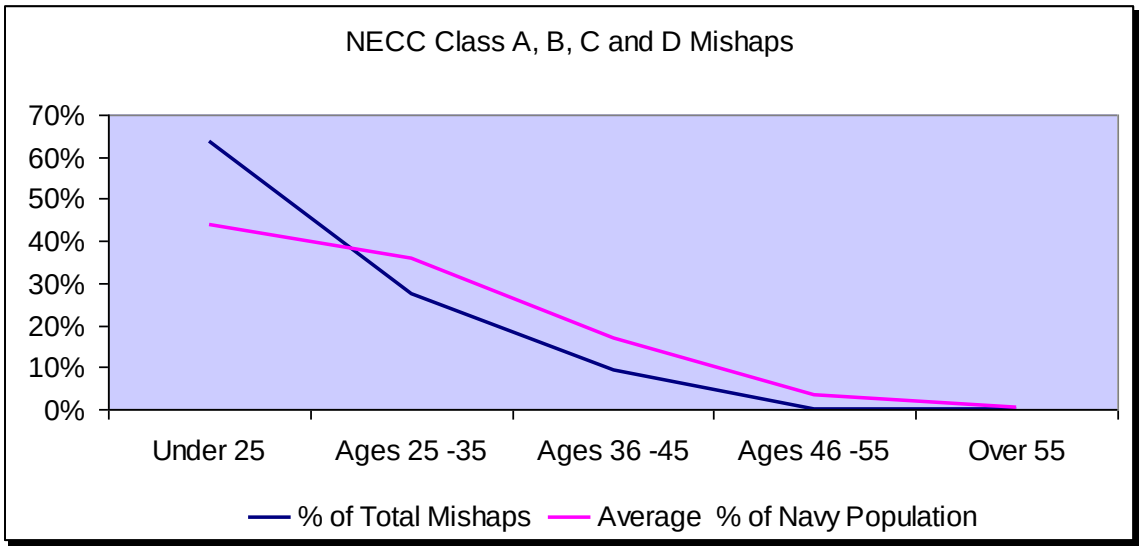

Figure 13

Figure 13 graphs the percentage of total Class A, B, C and D electrical shock mishaps for NECC and the ten year average percentage of the Navy population by age group. The percentage of total mishaps for the age group Under 25 is above the ten year average percentage of the Navy population for that age group. However, there is no statistically significant difference between the two percentages.

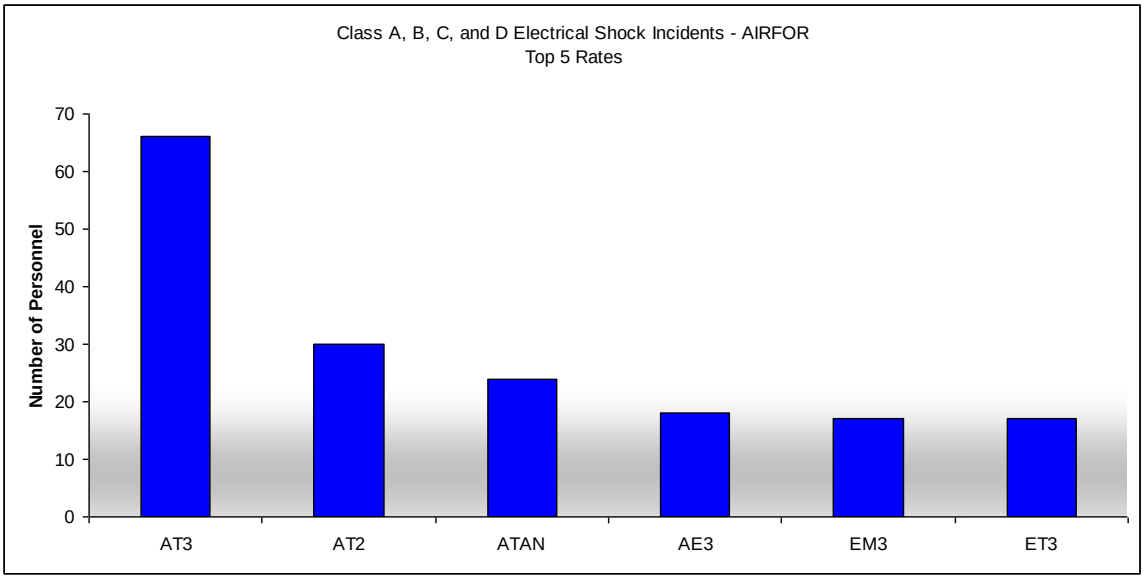

Figure 14

Figure 14 graphs the top 5 rates that are involved in electrical shock incidents from FY00 to FY09 for AIRFOR. AT3 have been involved in the most electrical shock incidents. However, there are 62 involved personnel that do not have the rate listed. This may affect the outcome of the top 5 rates.

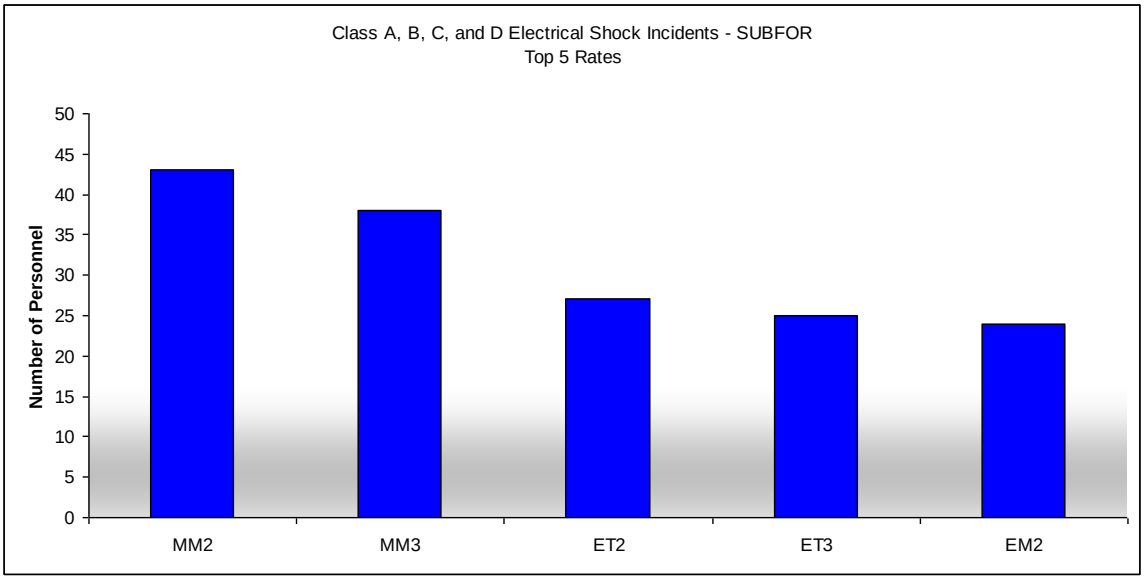

Figure 15

Figure 15 is the same graph as Figure 14 except is graphs the number of electrical shock incident per rate for the top 5 rates for SUBFOR. MM3 have been involved in the most electrical shock incidents. However, there are 30 involved personnel that do not have the rate listed. This may affect the outcome of the top 5 rates.

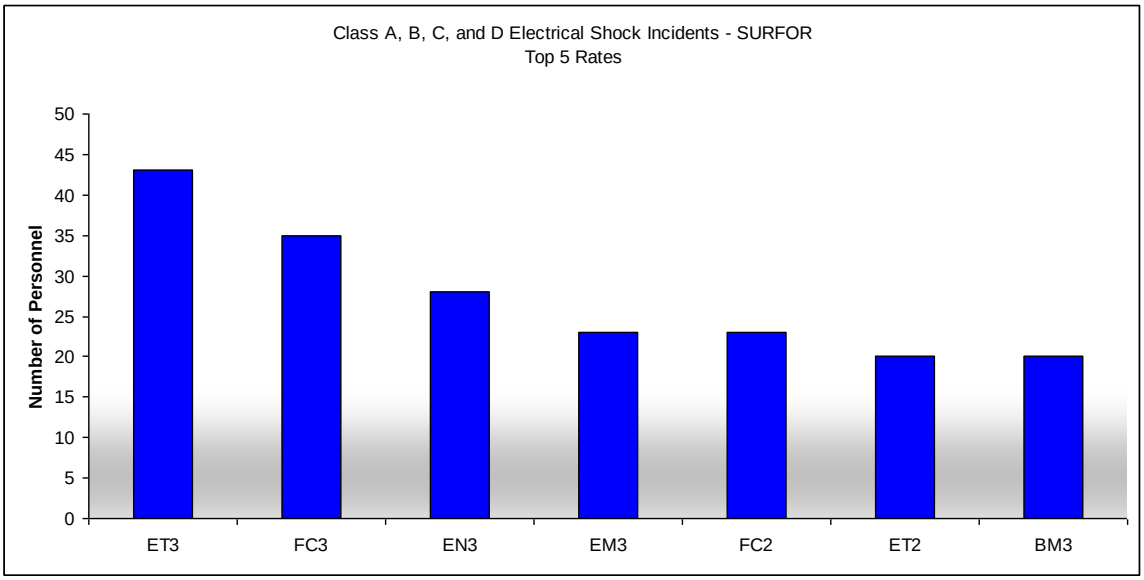

Figure 16

Figure 16 graphs the top 5 rates involved in electrical shock incident for SURFOR from FY00 to FY09. ET3 have been involved in the most electrical shock incidents however, there are 108 personnel that have been involved in electrical shock mishaps during this time frame that their rate is unknown. This will affect the outcome of the graph above.

There are not enough electrical shock incidents during FY00 to FY09 for NECC to conduct this analysis.

Appendix A: Hypothesis Testing Incident Rates

Two-Sample T-Test and CI: SURFOR FY00-04, SURFOR FY05-09

```
Two-sample T for SURFOR FY00-04 vs SURFOR FY05-09

                                 SE
                N   Mean  StDev  Mean
SURFOR FY00-04  5  202.0   23.9    11
SURFOR FY05-09  5   93.4   33.8    15


Difference = mu (SURFOR FY00-04) - mu (SURFOR FY05-09)
Estimate for difference:  108.6
95% CI for difference:  (64.8, 152.4)
T-Test of difference = 0 (vs not =): T-Value = 5.86  P-Value = 0.001  DF = 7
```

Paired T-Test and CI: SURFOR FY00-04, SURFOR FY05-09

```
Paired T for SURFOR FY00-04 - SURFOR FY05-09

                N   Mean  StDev  SE Mean
SURFOR FY00-04  5  202.0   23.9     10.7
SURFOR FY05-09  5   93.4   33.8     15.1
Difference      5  108.6   36.5     16.3


95% lower bound for mean difference: 73.8
T-Test of mean difference = 0 (vs > 0): T-Value = 6.66  P-Value = 0.001
```

Two-Sample T-Test and CI: SUBFOR FY00-04, SUBFOR FY05-09

```
Two-sample T for SUBFOR FY00-04 vs SUBFOR FY05-09

                                 SE
                N   Mean  StDev  Mean
SUBFOR FY00-04  5  328.5   66.6    30
SUBFOR FY05-09  5  218.4   85.9    38


Difference = mu (SUBFOR FY00-04) - mu (SUBFOR FY05-09)
Estimate for difference:  110.0
95% CI for difference:  (-4.9, 225.0)
T-Test of difference = 0 (vs not =): T-Value = 2.26  P-Value = 0.058  DF = 7
```

Paired T-Test and CI: SUBFOR FY00-04, SUBFOR FY05-09

```
Paired T for SUBFOR FY00-04 - SUBFOR FY05-09

                N   Mean  StDev  SE Mean
SUBFOR FY00-04  5  328.5   66.6     29.8
SUBFOR FY05-09  5  218.4   85.9     38.4
Difference      5  110.0  109.8     49.1


95% CI for mean difference: (-26.3, 246.4)
T-Test of mean difference = 0 (vs not = 0): T-Value = 2.24  P-Value = 0.089
```

Two-Sample T-Test and CI: AIRFOR FY00-04, AIRFOR FY05-09

```
Two-sample T for AIRFOR FY00-04 vs AIRFOR FY05-09

                N   Mean  StDev  SE Mean
AIRFOR FY00-04  5  107.8   13.0      5.8
AIRFOR FY05-09  5   40.6   14.3      6.4


Difference = mu (AIRFOR FY00-04) - mu (AIRFOR FY05-09)
Estimate for difference:  67.28
95% CI for difference:  (46.90, 87.66)
T-Test of difference = 0 (vs not =): T-Value = 7.80  P-Value = 0.000  DF = 7
```

Paired T-Test and CI: AIRFOR FY00-04, AIRFOR FY05-09

```
Paired T for AIRFOR FY00-04 - AIRFOR FY05-09

                N    Mean  StDev  SE Mean
AIRFOR FY00-04  5  107.83  12.97     5.80
AIRFOR FY05-09  5   40.55  14.26     6.38
Difference      5    67.3   24.4     10.9


95% lower bound for mean difference: 44.0
T-Test of mean difference = 0 (vs > 0): T-Value = 6.15  P-Value = 0.002
```

Two-Sample T-Test and CI: CIV FY00-04, CIV FY05-09

```
Two-sample T for CIV FY00-04 vs CIV FY05-09

             N   Mean  StDev  SE Mean
CIV FY00-04  5   3.91   2.96      1.3
CIV FY05-09  5  25.81   3.59      1.6


Difference = mu (CIV FY00-04) - mu (CIV FY05-09)
Estimate for difference:  -21.90
95% CI for difference:  (-26.83, -16.98)
T-Test of difference = 0 (vs not =): T-Value = -10.51  P-Value = 0.000  DF = 7
```

Paired T-Test and CI: CIV FY00-04, CIV FY05-09

```
Paired T for CIV FY00-04 - CIV FY05-09

             N    Mean  StDev  SE Mean
CIV FY00-04  5    3.91   2.96     1.33
CIV FY05-09  5   25.81   3.59     1.61
Difference   5  -21.90   4.42     1.98


95% upper bound for mean difference: -17.69
T-Test of mean difference = 0 (vs < 0): T-Value = -11.08  P-Value = 0.000
```

Two-Sample T-Test and CI: NECC FY00-04, NECC FY05-09

Two-sample T for NECC FY00-04 vs NECC FY05-09

	N	Mean	StDev	SE Mean
NECC FY00-04	5	4.72	6.46	2.9
NECC FY05-09	5	16.6	14.8	6.6

Difference = mu (NECC FY00-04) - mu (NECC FY05-09)
Estimate for difference: -11.85
95% CI for difference: (-30.42, 6.72)
T-Test of difference = 0 (vs not =): T-Value = -1.64 P-Value = 0.162 DF = 5

Appendix B: Rate Listing

Table A- 1

Rate	NECC
CE2	2
Blank	1
ENFN	1
IT3	1
MRFN	1
BU3	1
BUCN	1
CECN	1
CM2	1
EO3	1
RPSN	1
SWCN	1

Table A- 2

Rate	SURFOR
Blank	108
ET3	43
FC3	35
EN3	28
EM3	23
FC2	23
ET2	20
BM3	20
GSM3	19
HT3	17
EN2	16
EMFN	15
EM2	14
HT2	14
IC3	14
ENFN	12
MM3	12
EN1	12
HTFN	11
OS3	11
BM2	11
OS2	10
DC3	10
STG2	10
IC2	9
STG3	9
FC1	8
GSE3	8

Rate	SURFOR
IT3	7
EM1	7
GSE1	7
CSSN	6
MSSN	6
DC2	6
AT2	6
OSSN	6
BM1	6
MN3	6
MM1	5
MS3	5
CS3	5
IT2	5
SH3	5
DCFN	5
GSM2	5
MM2	4
ETSN	4
MS2	4
EMC	4
OSSA	4
ICFN	4
GSE2	4
SM3	4
ET1	3
MMFA	3
CS2	3
EMFA	3
FN	3
DC1	3
HT1	3
BMSN	3
ABH3	3
FCC	3
GMG2	3
GSEFN	3
MN2	3
QMSN	3
STGSN	3
MMFN	2
SN	2
MSSA	2
MS1	2
FCT	2
AOAN	2

Rate	SURFOR
CS1	2
SKSN	2
BMC	2
CSSR	2
MR2	2
SM2	2
ATAN	2
AE2	2
AS3	2
AD3	2
AO1	2
ICFA	2
AZ3	2
IC1	2
IT1	2
ITSN	2
ABF2	2
ABF3	2
CTRSN	2
CTT2	2
FCSN	2
GM3	2
GMSN	2
GSEFA	2
GSM1	2
MA1	2
OS1	2
OSSR	2
QM1	2
STG1	2
STGCS	2
MRFN	1
STS2	1
QM3	1
ETC	1
FTSN	1
YN3	1
HTFA	1
SK3	1
MRFA	1
PN3	1
AT3	1
AO3	1
AM3	1
ATAA	1
AE1	1

Rate	SURFOR
GMG3	1
ABAN	1
ABH1	1
AC3	1
AS2	1
CTR2	1
DCFA	1
SHSN	1
AG3	1
BMCS	1
CSSA	1
CT2	1
CTM2	1
CTO3	1
CTOSN	1
CTR3	1
CTRC	1
CTTSA	1
ENFA	1
EW2	1
EW3	1
GM	1
GM2	1
GMSA	1
GMSR	1
GSCS	1
GSEC	1
HTC	1
HTCS	1
ICC	1
IS2	1
ITSA	1
MA	1
MMFR	1
MN1	1
MNSA	1
MR3	1
MSC	1
MSSR	1
OSC	1
PR2	1
QM2	1
QMSA	1
SA	1
SHSR	1
SKCS	1

Rate	SURFOR
TM1	1
TMSN	1
YNSN	1

Table A- 3

Rate	SUBFOR
MM2	43
MM3	38
Blank	30
ET2	27
ET3	25
EM2	24
MM1	20
ET1	20
EM1	14
STS2	14
EM3	13
STS3	13
MMFN	11
ETSN	6
HTFN	5
CSSN	5
MT2	5
STS1	5
HT2	4
MSSN	4
MS3	4
MS2	4
SN	4
ETSA	4
MT3	4
EMFN	3
EMC	3
MMFA	3
MSSA	3
MS1	3
QM3	3
FTB3	3
EN3	2
BM3	2
HT3	2
CS3	2
IT2	2
CS2	2
FCT	2

Rate	SUBFOR
ETC	2
FTSN	2
YN3	2
TM3	2
MMC	2
ETCS	2
FT2	2
FTG2	2
FTG3	2
STSC	2
YN1	2
FC3	1
EN1	1
OS2	1
DC2	1
SH3	1
EMFA	1
FN	1
DC1	1
HT1	1
AOAN	1
CS1	1
SKSN	1
BMC	1
CSSR	1
MR2	1
SM2	1
HTFA	1
SK3	1
MRFA	1
PN3	1
YNSA	1
CSC	1
FT3	1
FTB2	1
FTSA	1
MT1	1
MTC	1
ND2	1
SKC	1
STSCS	1
STSSA	1
STSSN	1
TMSR	1

Table A- 4

Rate	AIRFOR
AT3	66
Blank	62
AT2	30
ATAN	24
AE3	18
ET3	17
EM3	17
MM3	15
ET2	11
AE2	11
AOAN	10
AO3	10
AEAN	10
EMFN	9
IC3	9
ABE3	9
EM2	8
MS3	7
HT3	7
MM2	5
HTFN	5
OSSA	5
AS3	5
AM3	5
ATAA	5
AM2	5
AMAN	5
ASAN	5
MMFN	4
BMSN	4
AEAA	4
MM1	3
HT2	3
FC3	3
SH3	3
DC3	3
DCFN	3
ICFN	3
ABH3	3
AE1	3
AME3	3
AO2	3
ET1	2
EM1	2
CSSN	2

Rate	AIRFOR
MSSN	2
CS3	2
TM3	2
OS2	2
HTFA	2
FC2	2
OS3	2
AD3	2
AO1	2
ICFA	2
GMG3	2
ACAN	2
AM1	2
AS1	2
AT1	2
HM2	2
ETSN	1
MS2	1
MMFA	1
MSSA	1
BM3	1
FCT	1
ETC	1
MMC	1
EMFA	1
FN	1
CS1	1
SKSN	1
SK3	1
YNSA	1
EN2	1
IT3	1
OSSN	1
AZ3	1
IC1	1
IT1	1
ITSN	1
ABAN	1
ABH1	1
AC3	1
AS2	1
CTR2	1
DCFA	1
SHSN	1
ABE2	1
AD2	1

Rate	AIRFOR
ADAA	1
ADAN	1
AEAR	1
AKAN	1
AME2	1
AMEAA	1
AMEAN	1
AMS	1
AMSAN	1
AN	1
AOAA	1
AOAR	1
ASAR	1
AZ2	1
BMSA	1
BU1	1
CT	1
EWSA	1
FCCM	1
GMC	1
GMM3	1
HM1	1
HM3	1
LISN	1
LISR	1
LNC	1
MMCS	1
PHAN	1
PNSN	1
PR3	1
PRAN	1